Hugin tutorial — Stitching two photos together

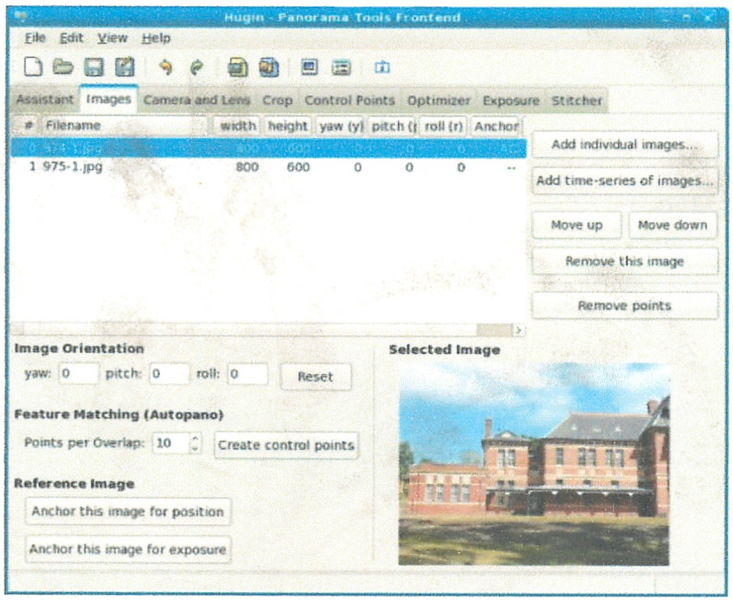
The entire process described here, of taking two handheld photographs and sticking them together into a single image, can be performed completely automatically by just clicking *Align* in the Hugin *Assistant* tab. This tutorial looks 'under the hood' of Hugin and introduces some of the concepts and functions that are needed for more advanced use.

Note: This tutorial is based on the 0.7.0 version of Hugin. Although your version may differ, the underlying principle will remain the same.

You can download the two photos used in this example (974-1.jpg, 975-1.jpg) and try it yourself.

Start by launching Hugin, and using the **Images** tab select **Add individual images...** button to select the two images you want to stitch.

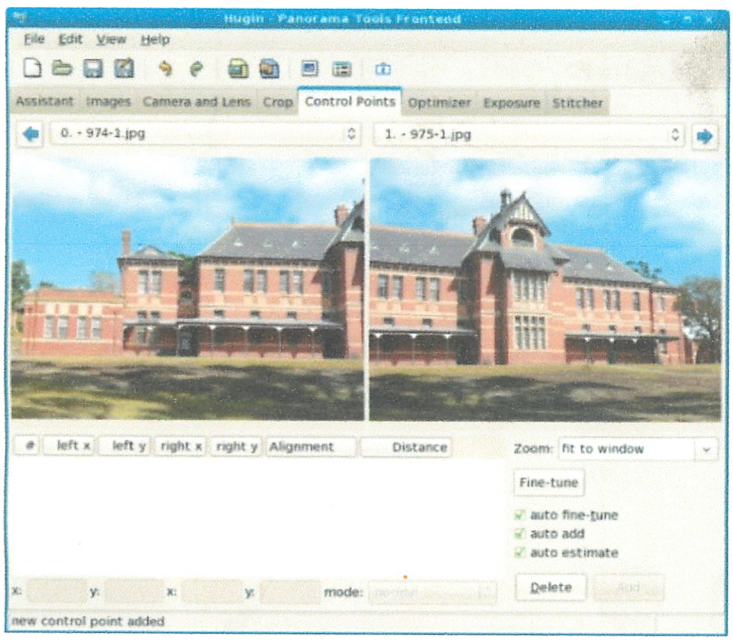
Tip: you can select multiple images in the file dialog box or drag and drop files from a suitable file browser.


Hugin - Panorama Tools Frontend
File Edit View Help
Assistant Images Camera and Lens Crop Control Points Optimizer Exposure Stitcher
Filename width height yaw (y) pitch (p) roll (r) Anchor
1 975-1.jpg 800 600 0 0 0
Add individual images...
Add time-series of images...
Move up
Move down
Remove this image
Remove points
Image Orientation
yaw: 0 pitch: 0 roll: 0 Reset
Selected Image
Feature Matching (Autopano)
Points per Overlap: 10 Create control points
Reference Image
Anchor this image for position
Anchor this image for exposure

Select image #0 then click on **Anchor this image for position** and **Anchor this image for exposure**. You might want to try this tutorial again later selecting image #1 to see what difference these choices make.

If you select or drag in image files which don't have complete EXIF data, the **Camera and Lens data** dialog box will open asking for camera and lens data. For a normal pocket camera it is usually safe to enter **50** deg for the **HFOV** (Horizontal Field of View).

Switch to the **Control points** tab, this is where you are going to input all the information the software needs to align the two images.



Click on the title bar above each image to select image **0** on the left hand side and image **1** on the right hand side.

Make sure that **Zoom** is set to **fit to window** and that both **Auto fine tune** and **Auto add** are set.

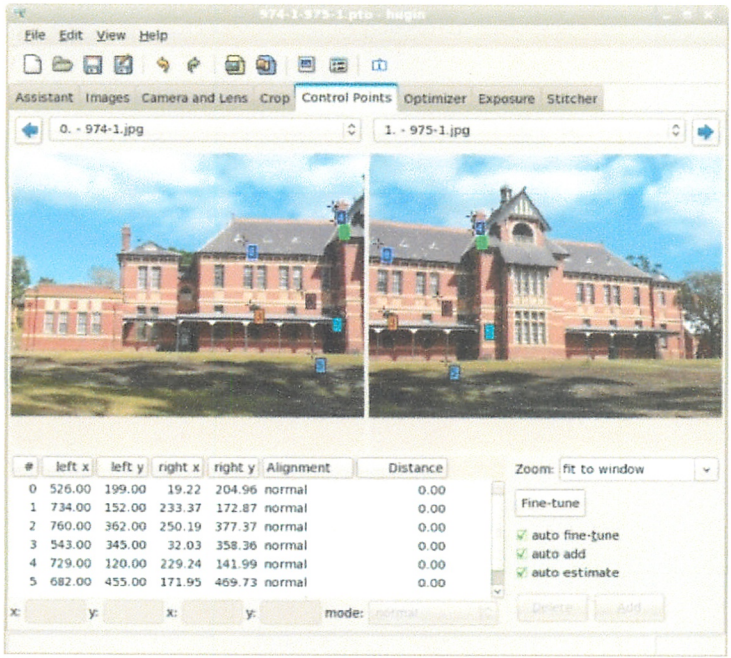
Now you can use the mouse to select control points; pick well defined features that you can see in both the left and right-hand window.

Hugin aligns images using these *control points*, each is actually a pair of locations, one for each of the two images being connected.

When you first select a point a high magnification window will open to help you with selection. If you hold down your left mouse button you can roam around until you have the cross hairs just where you want them.

For the first *control point* you will then need to go to the other image and click the corresponding location, Hugin will then automatically fine-tune this position. For subsequent points, when you have finalised your selection on the first image Hugin will automatically find the point in the second image.

Repeat until you have about 5 or 6 pairs of control points.

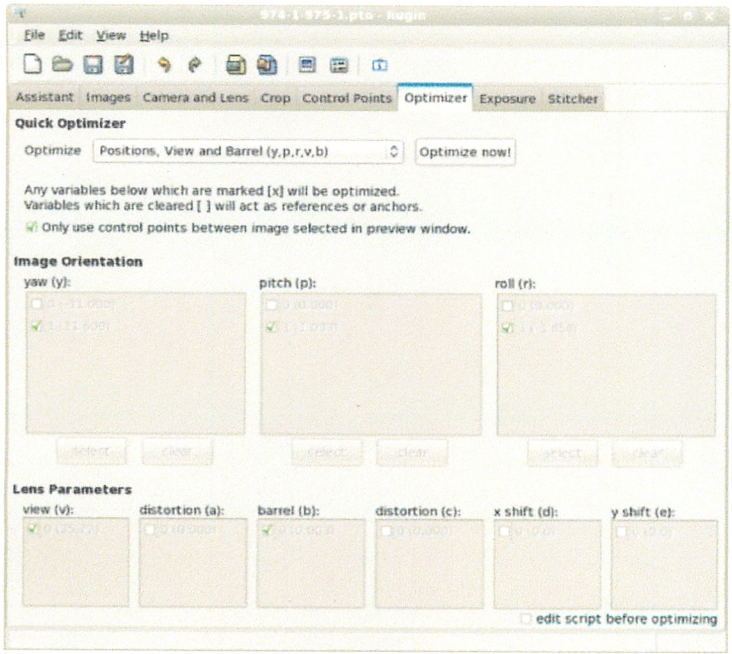

File Edit View Help
Assistant Images Camera and Lens Crop Control Points Optimizer Exposure Stitcher
0. - 974-1.jpg
1. - 975-1.jpg
left x left y right x right y Alignment Distance
0 526.00 199.00 19.22 204.96 normal 0.00
1 734.00 152.00 233.37 172.87 normal 0.00
2 760.00 362.00 250.19 377.37 normal 0.00
3 543.00 345.00 32.03 358.36 normal 0.00
4 729.00 120.00 229.24 141.99 normal 0.00
5 682.00 455.00 171.95 469.73 normal 0.00
Zoom: fit to window
Fine-tune
auto fine-tune
auto add
auto estimate
x: y: x: y: mode:

Now select the **Optimizer** tab. Hugin uses an optimisation scheme where it adjusts image orientation and lens settings of source photos until the control-points line-up.

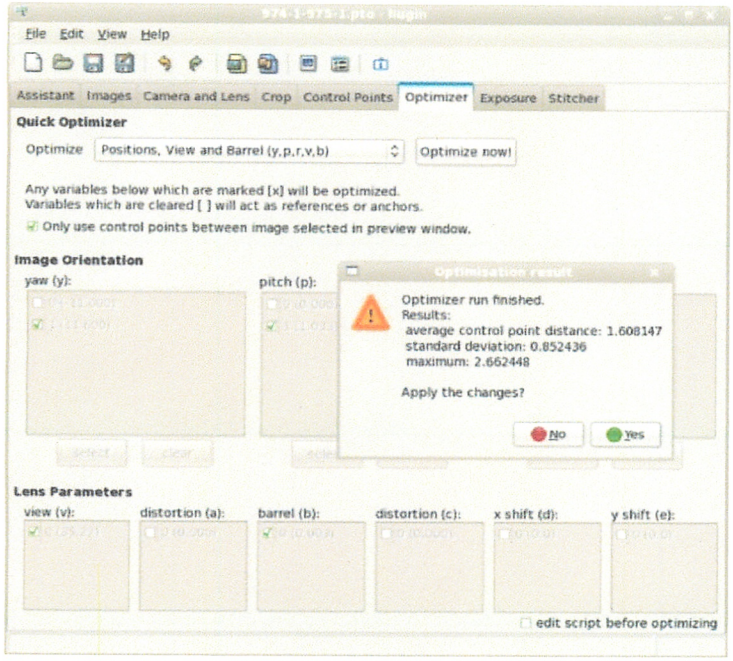
The plan here is to keep the first image fixed and adjust the position of the second image to fit. You can do this by selecting **Optimize Positions (incremental, starting from anchor)**.

However the lens parameters can be optimised at the same time; for now optimise *HFOV* (horizontal field of view) and correct barrel distortion by selecting **Optimize Positions, View and Barrel (y,p,r,v,b)**.

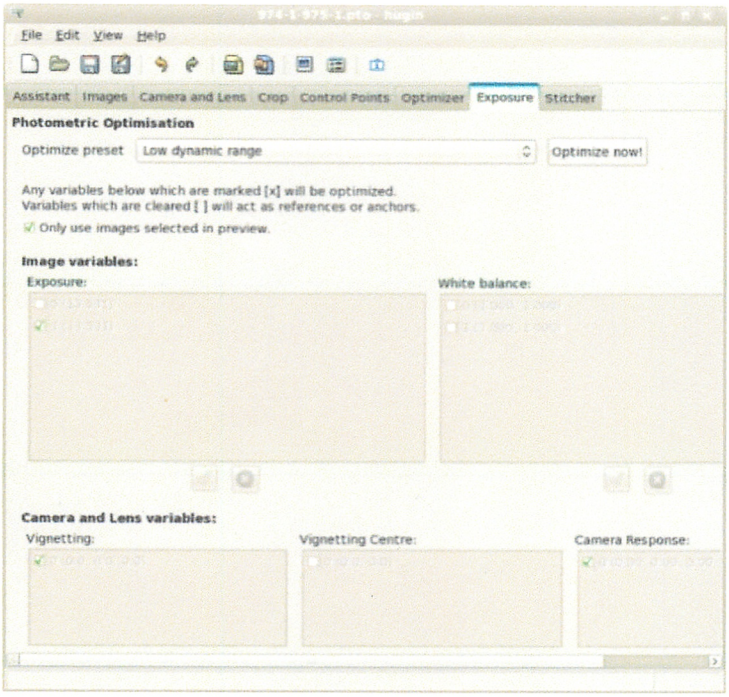
Tip: Although you can optimise all hfov, a, b, c, d & e parameters, most of the time the hfov and b parameters are the only significant lens numbers you need to consider.


File Edit View Help
Assistant Images Camera and Lens Crop Control Points Optimizer Exposure Stitcher
Quick Optimizer
Optimize Positions, View and Barrel (y,p,r,v,b)
Optimize now!
Any variables below which are marked [x] will be optimized.
Variables which are cleared [ ] will act as references or anchors.
Only use control points between image selected in preview window.
Image Orientation
yaw (y):
pitch (p):
roll (r):
Lens Parameters
view (v):
distortion (a):
barrel (b):
distortion (c):
x shift (d):
y shift (e):
edit script before optimizing

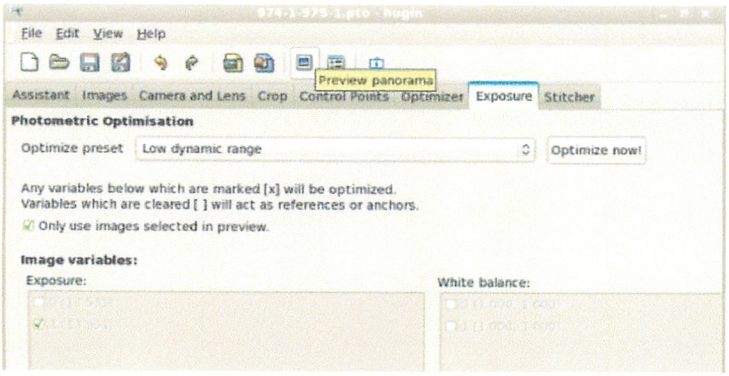
Click on the **Optimize now!** button and wait while the optimiser tries to find a good fit. When it is done you will need to **Apply** the changes.



Select the **Exposure** tab. Choose **Low dynamic range** and click **Optimize now!** You might want to try this again with a different optimisation setting to see the effect.


File Edit View Help
Assistant Images Camera and Lens Crop Control Points Optimizer Exposure Stitcher
Photometric Optimisation
Optimize preset
Low dynamic range
Optimize now!
Any variables below which are marked [x] will be optimized.
Variables which are cleared [ ] will act as references or anchors.
Only use images selected in preview.
Image variables:
Exposure:
White balance:
Camera and Lens variables:
Vignetting:
Vignetting Centre:
Camera Response:

Before we generate the stiched panorama, select **Preview panorama** icon (or find it in the **View** menu).

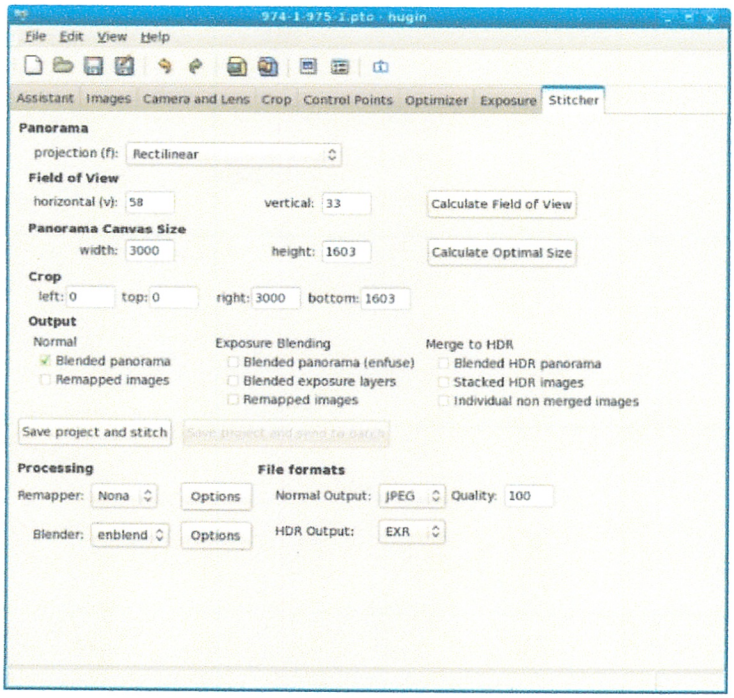

File Edit View Help
Preview panorama
Assistant Images Camera and Lens Crop Control Points Optimizer Exposure Stitcher
Photometric Optimisation
Optimize preset Low dynamic range
Optimize now!
Any variables below which are marked [x] will be optimized.
Variables which are cleared [ ] will act as references or anchors.
Only use images selected in preview.
Image variables:
Exposure:
White balance:

In this window we need to set the projection to **Rectilinear**, this is equivalent to a normal wide angle camera.

Panorama preview
Center Fit Straighten Num. Transf. Auto Update All None
displayed images
Preview Options
projection (f): Rectilinear
Blend mode: normal
Output: LDR
EV: 13.53
Left click to define new center point, right click to move point to horizon.
-43.0 14.3
58.0 x 33.0

The **Straighten** icon can be used to automatically centre, level and fit the field of view to the images. You can alternatively do this manually by adjusting the sliders at the edges and by clicking in the preview itself to re-centre the view.

Finally we are going to generate the output image. Select the **Stitcher** tab.



The projection should be Rectilinear, and having adjusted the field of view in the preview window these settings should not need to be altered. Select **Blended panorama** under **Normal output**, and under **File formats - Normal output** choose whatever suits you. Here we have chosen **JPEG**. Select **Save project and stitch**. Firstly, project files will be saved to your selected location (these can be opened again later in Hugin to revisit the process) and finally you will be asked for a filename prefix for the final panorama.

Adjusting the perspective of the final panorama is a subject for another tutorial.

The old building is part of Victoria University, Sunbury, near Melbourne, Australia.

Original tutorial by Bruno Postle created October 2003, updated October 2006 - Updated for Hugin 0.7.0 by Terry Duell April 2008